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as like that of a relatively paramagnetic mass of air; and when its position was reversed, its action was representative of that of a heated or relatively diamagnetic mass of air. Bringing this helix into the vicinity of small magnetic needles, suspended either freely, or so as to show declination or inclination, the planes of action or indifference as regards the power of deflecting the lines of force and the needle were observed. When the needle can move only in one plane, there are four quadrants, formed (in the case of the declination needle) by the intersection of the planes of the magnetic equator and meridian. When in these planes there is no deflection at the needle, but when in the quadrants there is, and in opposite directions in the neighbouring quadrants.

As the lines of force are held in and by the earth, so these experiments were repeated with a needle in near vicinity to a magnet, and the difference of effect is pointed out: then the extent to which these results are applicable to those of the earth is considered, and their utility in guiding the inquirer.

The effect of heated air having been considered in the last paper, that of cold air is now taken up; and after considering its action in causing a contraction or drawing together of the terrestrial lines of magnetic force, according to the principles of conduction before enunciated, the author considers generally where the regions of cold which travel round the earth every twenty-four hours will be in the northern and southern hemispheres, and how they will grow up and diminish in extent and importance as the sun moves north and south during the year. After which he applies these considerations, and the results of the experiments with the ring helix, to the explication of the changes of the needle as they are given by observations at St. Petersburgh, Greenwich, Hobarton, Toronto, Cape of Good Hope, St. Helena and Singapore. In doing this, he endeavours to explain the night action, the early morning effect, the contrary course of the needle for the same hours in different months, the difference of local time dependent on the distribution of land and water, the cumulative effect of preceding months, and the continual effect, especially in the tropical regions, of the higher temperature of the northern hemisphere above that of the south. In all these points the author sees such an agreement between the natural results and those which are suggested by the assumed physical cause of the magnetic variations, as to give him a growing confidence in the truth of the views he has put forth.

November 30, 1850.

At the Anniversary Meeting,

The EARL OF ROSSE, President, in the Chair.

Mr. Edward Solly, on the part of the Auditors of the Treasurer's Accounts, reported, that the total receipts during the past year, in-

cluding a balance of £553 4*s*. 9*d*., amounted to £3730 4*s*. 3*d*.; and the total expenditure, during the same period, amounted to £3573 5*s*. 7*d*., leaving a balance in the hands of the Treasurer of £156 18*s*. 8*d*.

The thanks of the Society were given to the Auditors for the trouble they had taken in examining the Treasurer's Accounts.

The thanks of the Society were given to the Treasurer.

List of Fellows of the Royal Society deceased since the last Anniversary (1849).

On the Home List.

Thomas Amyot, Esq.
Sir Felix Booth, Bart.
Sir Mark Isambard Brunel.
John Caldecott, Esq.
William James Frodsham, Esq.
Rev. William Kirby.
Right Hon. Sir Robert Peel, Bart.
Right Hon. Lord Petre.
William Prout, M.D.
Sir Martin Archer Shee.
James Smith, Esq.
Right Hon. Lord Stanley of Alderney.
Captain Owen Stanley, R.N.
James Thomson, Esq.
William Vaughan, Esq.

On the Foreign List.

H. M. D. de Blainville.
Joseph Louis Gay-Lussac.

Defaulters.

Charles Dickson Archibald, Esq.
John Burnet, Esq.
Right Hon. the Earl of Mountcashell,
John Scott Russell, Esq.

List of Fellows elected into the Royal Society since the last Anniversary (1849).

On the Home List.

William Henry Barlow, Esq.
George Busk, Esq.
Thomas Blizard Curling, Esq.
George Edward Day, M.D.
Warren De la Rue, Esq.
William Fairbairn, Esq.
Robert James Graves, M.D.
Levett Landen Boscawen Ibbetson, Esq.
Charles Handfield Jones, M.B.
James P. Joule, Esq.
Rt. Hon. Lord Londesborough.
John Fletcher Miller, Esq.
Major Henry Creswicke Rawlinson.
Edward Schunck, Esq.
Daniel Sharpe, Esq.
John Tomes, Esq.

On the Foreign List.

H. W. Dove.
Joseph Liouville.
J. E. Purkinje.
Wilhelm Weber.

The President then addressed the Meeting as follows:—

Gentlemen,

It now becomes my duty, according to custom, to give a slight sketch of the events of the year which appear to be of most interest to us as a scientific body; but first permit me to express my deep sense of obligation to your Council. They have applied themselves so unremittingly to the discharge of the large amount of business which has devolved upon them, and have examined each question so thoroughly, that there has been little room for difference of opinion, and therefore my duties have been light, and free from anxiety.

Permit me also to return thanks to the distinguished men, Fellows of this Society, who, called in by the Council to aid them in wielding the new powers which they derive under the Government Grant, have rendered such important services.

You are no doubt aware that the first step taken by your Council in reference to the Government Grant, was to appoint a Committee, composed of the Council and an equal number of other Fellows, to make suitable regulations, and decide on the applications for aid in carrying out scientific objects. I am sure you will concur with me in thinking that your Council, in undertaking new and heavy responsibilities, where a great experiment was about to be tried, and where a false step at the beginning might have led to so much mischief, did wisely in seeking, in the varied talents and acquirements of a large Committee, a guarantee against any serious error.

I believe there were some not without their doubts as to the eventual success of the experiment, seeing that it had not always been an easy matter to apply the small fund previously available for similar objects: there were even some, I believe, who apprehended that abuses might spring up injurious to the Society. To me, I may perhaps be permitted to say, these doubts and apprehensions did not appear to be well-founded: it is but a short time since you conferred a Medal on M. Regnault for very able and elaborate researches, carried on at the expense of the French Government; if the French Government had not supplied the means, the experiments could not have been made. You are about to confer the Copley Medal on the distinguished astronomer, Professor Hansen, for his discoveries in Physical Astronomy; and it is a remarkable fact, that he has been for some time engaged in the construction of new lunar tables, the moon's place being so far in error as to produce serious practical inconveniences: this work was commenced in time of peace with funds provided by his own Government, but is now about to be completed with funds supplied to him by our Government. Here were two examples strikingly brought before us by our own recent proceedings, illustrating the position, that while the man of science supplies the mind, others often must supply the hands. There were many other similar examples; but, moreover, the *à priori* reasoning appeared to me to be conclusive; for if we except pure geometry, there seemed to be no other science where

there were not often constants to be determined at an expense of time and labour, which it would be a lavish waste to require from men of genius actually engaged in prosecuting original discovery. There was, I may add, in addition, the experience of the British Association and of foreign Governments. That there were men amongst us able and willing to enter the many tempting fields of scientific inquiry no one could doubt,—men ready to labour for us assiduously, provided that in doing so they were not called upon to make too great a sacrifice. As to abuses, it was evident that the Committee would frame regulations so as not only to make abuse impossible, but to remove all reasonable grounds even for the suspicion of abuse.

Soon after their appointment the Committee laid down certain rules and certain general principles for their guidance, which, although not irrevocably binding, nevertheless stand as precedents not lightly to be disregarded. The rule, that in every case there should be a Committee of three Fellows charged with the responsibility of seeing that the intentions of the Council in making the grant were strictly carried out, is in my opinion of great importance. Without such a rule it is probable that many of our ablest men, from a feeling of delicacy, coupled with an apprehension of a vague, indefinite responsibility, would hesitate to accept assistance. I will not detain you by entering into any further particulars, as all the proceedings are recorded on the Minutes of Council, to which you have access; but I am happy to be able to say, that although the season was far advanced before the intentions of the Council seem to have been generally understood, still there were many applications from men of eminence engaged in carrying out important objects, and even on this the first occasion there was no difficulty in making an effective appropriation of the grant.

Looking to the future, I think we may venture to anticipate that Parliament will annually place a similar sum at our disposal, so long as we can usefully employ it; and that while we shall thus be enabled to advance science in certain directions where otherwise we could have effected but little, we shall remain as free to exercise our own unbiassed judgements, and as perfectly independent as at any previous period of our history.

In this age of progress, when each month has its new facts, it would be vain to take a general survey of the discoveries of the year with a view of pointing out a certain number as the most important: experience has shown that time often affords the only real test of comparative value, as some discoveries apparently the most promising have in the end proved utterly barren; while others, at first sight of little moment, have led to the most brilliant results. It would be impossible, however, to look through the scientific publications of the year, however cursorily, without perceiving that much had been done. Our continental neighbours have been as energetic and as successful as usual; and I am sure you have been happy to observe, that in the United States, in the midst of the business and all-engrossing pursuits of a new country, science is engaging in-

creased attention; many very able men are springing up, and an association for the advancement of science has been formed and is well supported. Several observatories, furnished with the best instruments, principally from the manufactories of continental Europe, have been established. An astronomical expedition has been sent to the southern hemisphere, by authority of the federal government, under the command of Lieut. Gillies, principally for the purpose of making observations, which, used in conjunction with others in the northern hemisphere, may determine more accurately the parallax of the sun and the dimensions of the solar system. No observations have yet been received from the expedition, but it is known that an observatory has been established for its use at Santiago.

Much also has been done by the labour of private persons: an astronomical journal of great merit has been established; and several of the investigations published in it, as, for instance, on the velocity of the galvanic current, on the elements of Neptune, and on the wonderful comet of 1843, will probably be considered as standards.

One of these deserves especial mention. It is known that Bessel's examination of the places of Sirius and Procyon for many years past led him to the conclusion that these stars are subject to the action of some unknown force, and he suggested the attraction of invisible companions; now lately M. Schubert has examined, in the same way, the movements of Spica, and has come to the conclusion that it moves in an apparently small orbit, with a periodic time of forty years. Such conclusions, it is unnecessary to observe, are extremely doubtful, but the inquiries which have led to them are deserving of our best attention.

In the methods of observing, a step has also been taken by the astronomers of the United States which deserves particular notice. In a country in which the use of the electric telegraph is so extensively developed, it was natural that the application of this mode of instantaneous communication, to the determination of terrestrial longitudes, should soon suggest itself; indeed the principle had been suggested by Mr. Wheatstone as far back as 1840*; and it was then an easy step to make the galvanic wire an instrument for transmitting, not the comparison of the clock, but the actual observation of the transits over every individual wire of the transit telescope. For this purpose it was necessary in a series of stations to place only one moderately good clock, to be used in the following manner. An endless fillet of paper being carried by independent mechanism, under a style, which is pressed upon it by the action of a galvanic magnet, that derives its force from a wire passing through all the stations, and animated by a battery in any part; if the clock be so connected with the circuit that at every vibration of the pendulum the circuit is interrupted, the trace made by the style upon the paper fillet will be interrupted at every second. Now if at each of the observing stations the wire be carried through such an apparatus that the cir-

* Bulletin de l'Académie Royale de Bruxelles, 7th October 1840, and Comptes Rendus, tome xx. p. 1554.

cuit can at any instant be broken by a touch of the observer, it will be in his power, by a mere movement of his finger when the object passes each wire of the transit telescope, to exhibit in the impressed trace on the fillet a series of interruptions, peculiar to the observation, mingled in their proper places with the series of interruptions produced by the clock. As this can be done at each station without impeding the similar operations at the other stations, it is evident that several series of strictly comparable observations may be recorded on the same fillet of paper; one wire only being necessary, and indeed only one being applicable. It then became a question whether an analogous method of recording transits might not be available for the observations of a single observatory, without reference to the problem of determining terrestrial longitudes. For this purpose it appeared best to reverse the relations of the clock and galvanic current, so that the vibration of the pendulum should make an impress upon a fillet or revolving disc. Practically, it is found necessary to have another battery, another wire, another galvanic magnet, and another style for making the impression corresponding to each observed transit over a wire of the instrument: if it happens that there are in the same observatory several instruments where observations are to be comparable, by a proper arrangement of wires all these observations may be recorded by means of the same style. Numerical evidence is adduced to show that the irregularity of transits thus observed is far less than that of transits observed by the eye and ear; and there is no doubt that the number of observations made in a given time may be very much greater than that of observations made on the old system. On the other hand, the after-labour of reading off these graphical transits, and converting them into numbers, will be considerable. I am not aware that this method of observation has been used on our side of the Atlantic, although I am able to assert that it has engaged the attention of some of the English observers. Preparations are making at the present time for trying it at the Royal Observatory at Greenwich. It is proposed to record the transits taken with the new transit circle, and those taken with the altitude and azimuth instrument, on the same recording surface. Numerous experiments have been made in America by Mitchell, Walker and others, for determining with the aid of this system of record, the velocity of the galvanic pulse through the ordinary telegraph wires. The inquiry however is one of peculiar difficulty, and I am happy to find it is engaging the attention of scientific men.

Since our last meeting, the first volumes of Liebig and Kopp's very interesting annual report on the progress of Chemistry and the allied sciences have issued from the press. Full and complete as to Chemistry, it is a very excellent index to the recent papers on physical science in the periodicals, and supplies that kind of information so useful to a man, who, fully occupied with one engrossing pursuit, is anxious to know something of what is passing around him. Of the progress, however, of abstract mathematics it gives no account: there, however, there has been progress also. Indeed,

just as the increase of manufactures has always led to further efforts to perfect the beautiful machines, called tools, so the progress of physical science has at all times promoted the study of abstract mathematics. It was thus that the attempts to solve problems relating to attraction, heat, and electricity, led to the discovery of the most remarkable properties of definite integrals. To the fruits gathered from this branch of mathematics by Euler, Legendre, and other most illustrious analysts of past generations, our own contemporaries, both on the continent and in this country, have added results of the utmost value. Abroad, Jacobi, Cauchy, Dirichlet, Liouville and Catalan, have not only assigned the values of definite integrals previously unknown, but, what is of more consequence, they have established in relation to them several theorems of the greatest generality and elegance. Amongst ourselves, Mr. Ellis, Mr. Boole, Mr. Cayley, Mr. Thomson and Mr. Hargreave, have pursued the same track with distinguished success. Within the last two years the mathematicians of Germany have diligently cultivated the study of definite integrals, determining their values, investigating their properties, and employing them in the summation of infinite series.

The theory of elliptic integrals having lately formed the subject of an elaborate report laid before the British Association for the Advancement of Science, I need say little more in reference to the cultivation of it, than that the illustrious author of the *Fundamenta Nova* still labours at the building up of his theory; nor does he want the aid of fellow-labourers who have profited by his teaching. The volumes of Liouville's and Crelle's journals, for the last two years, contain articles on this subject by Guderman, Liouville, Mayer and Cayley. Mathematicians have made some curious applications of the theory of elliptic functions to the solution of problems in geometry: of these, the following is one of the most remarkable:—If a rectilinear polygon admits of being inscribed in one circle, and circumscribed about another, there exists an equation of condition between the radii of the two circles, and the mutual distance of their centres. Jacobi first pointed out the connexion between the problem of determining this condition, and that of dividing an elliptic function into as many equal parts as the polygon has sides. In a recent number of Crelle's Journal, Richelot has published an interesting paper, in which he shows how to derive the equation of condition in its rational and simplest form, from the formulæ which relate to the division of elliptic functions.

Geometry, both pure and analytic, has of late engaged much of the attention of foreign mathematicians. The general properties of surfaces relating to their tangent planes and normals, to their radii and lines of curvature, and to the shortest lines traced upon them, have been investigated afresh by various methods; old theorems have been brought into forms better suited for particular application, and many new ones have been arrived at. In the discussion of surfaces of the second order in particular, very interesting results have been obtained. The difficulties which attended the integration

of the differential equation of their geodetic lines having been at length overcome, the properties of these curves, and also of the lines of curvature, have been carefully investigated by the geometers of different countries. Abroad, the first important steps were made by Jacobi, Joachim, Stahl and Liouville. Profiting by their labours, Mr. Michael Roberts made the remarkable discovery that the lines of curvature of an ellipsoid are related to its umbilics, as a central conic section to its foci. Since then, Chasles, Liouville, Graves, Hart and others, have arrived at various theorems concerning the geodetic lines, and lines of curvature of surfaces of the second order.

In the theory both of surfaces and curves, considerable advances have been recently made by means of general methods of transformation. Thus, from theorems already established, new ones are derived without the need of an independent demonstration. Mr. William Roberts, Mr. Thomson and Mr. Cayley, have lately furnished methods for transformation, by the use of which new and interesting properties of curves have been established. The progress made in the evaluation of definite integrals has likewise led to many discoveries respecting the rectification of curves, and the quadrature of surfaces.

In ordinary algebra and the theory of equations, no very considerable advance has been made during the last two years. I ought not, however, to omit noticing a valuable paper, on Sturm's Functions, contributed by Mr. Cayley to Liouville's 'Mathematical Journal.' Crelle's Journal also contains some useful memoirs on continued fractions, infinite series, and the results of certain substitutions in functions of different degrees.

The theory of numbers has of late found favour in the eyes of mathematicians. Jacobi and other writers in France and Germany have given to the public several interesting papers on different subjects belonging to this department of mathematics; but of recent contributions to it, perhaps the most remarkable has been made in this country by Mr. Hargreave, in a paper "On Prime Numbers," published in the 'Philosophical Magazine.' Sir John Herschel has also very recently written on the same subject; his paper, as you will recollect, was read last Session, but is not yet published.

The theory of La Place's coefficients, so successfully treated by Mr. Hargreave and by Mr. Boole, has been lately made the subject of a memoir by Mr. Cayley, in which he has shown how to extend it to any number of variables. Neumann has also exhibited a method of developing, in a series proceeding according to La Place's functions, the distance between two points expressed by means of elliptic coordinates. In addition to the papers already enumerated, I observe that several relating to the solution of differential equations, the properties of particular series, factorials, faculties, and determinants, have been contributed to the principal scientific journals.

Before concluding this brief and necessarily imperfect review of the recent progress of mathematics, I cannot abstain from remarking, that two of the fields of research which promised best to reward

the labours of the mathematicians appear of late to have been cultivated almost exclusively by our own countrymen,—I refer to the Calculus of Operations and the Theory of Imaginaries. Two important papers on the former subject have lately appeared in our Transactions, and have earned for their authors the Medals of the Society. In the latter field, Mr. De Morgan, Mr. John Graves, Mr. Charles Graves, and Mr. Kirkman, have succeeded in obtaining many curious and interesting results; but the most valuable seems to be those which have been arrived at by Sir William Rowan Hamilton in his Theory of Quaternions: his late application of it to the geometry of three dimensions, and to questions in optics and astronomy, evidently prove the power of this Calculus as an instrument of invention and research.

I regret to say, that since our last Meeting we have lost many eminent men; the obituary memoirs, however, seem to me to call for no particular remark, with one exception, that of the distinguished chemical philosopher Gay-Lussac. That memoir has been prepared by M. Biot, and I am sure you will concur with me in thinking, that in performing that duty he has conferred a great obligation on the Royal Society and on all men of science; the memoir will be read, uninjured by translation, just as we have received it.

Col. Sabine,

I have the honour of presenting to you the Copley Medal in charge for Professor Hansen. It has been awarded to him for his discoveries in Physical Astronomy.

To have contributed even a little to the advancement of that science, as it exists at the present day, would have been no mean achievement. Hansen has done much more; his contributions are of a very high order. Previously to the appearance of Hansen's memoirs, two methods had been employed in the determination of the planetary perturbations. One of these, known by the name of the method of variation of elements, besides being exceedingly beautiful in theory, is peculiarly well adapted to the determination of the secular variations and the inequalities of long period. It has the disadvantage, however, that the number of elements whose perturbations we are thus required to calculate, is twice as great as that of the coordinates, the perturbations of which are the final objects of investigation; and also that the former perturbations are frequently much greater than the latter. In order to take into account the square of the disturbing force, which is quite necessary in the present state of astronomy, we must find the change introduced into the perturbation of each element of the disturbed planet, by the perturbations of each several element both of the disturbed and disturbing planets. Consequently, unless we content ourselves with the selection of a few of the most important terms, the calculations become extremely long and laborious.

In the second of the methods above alluded to, the perturbations

of the planet's coordinates are found at once by the integration of the proper differential equations. But this method, though perhaps preferable to the former for calculating the inequalities depending on the first power of the disturbing force, is inapplicable, or at any rate seems as yet not to have been applied to the calculation of those which depend on the square and higher powers of that force, so that it cannot be regarded as affording a complete solution of the problem.

In Hansen's method, the perturbations are applied to the *mean* longitude and to the *logarithm* of the radius vector. The disturbed mean longitude, combined with *invariable* elements, gives the true longitude in the orbit, and the logarithm of the true radius vector is found by adding its perturbations to that value which corresponds with the disturbed mean longitude and the same invariable elements as before. The perturbations of latitude are determined in a manner more analogous to the ordinary method of variation of elements. Thus, with respect to the longitude and radius vector, Hansen avoids the inconvenience of having to calculate the perturbations of twice as many quantities as are finally wanted, while at the same time his formulæ take into account all powers of the disturbing force.

Hansen finds also that the series which expresses the perturbations of the *mean* longitude is more convergent than that in ordinary use which gives the perturbations of the *true* longitude; and Mr. Adams found this to be the case in his investigation of the disturbances of Uranus, the use of the perturbations of the *mean* longitude, instead of those of the *true*, having been attended with considerable advantage.

Astronomers have long seen the convenience of applying the inequalities of long period to the *mean* longitude of the planet, and similar advantages, though not of so marked a character, follow from applying all the inequalities in the same manner.

Only a part of Hansen's investigations respecting the perturbations of bodies moving in orbits of great excentricity and inclination has yet appeared. In this part he treats of the case where the distance of the disturbed body from the sun is always less than that of the disturbing. This is perhaps the most important case, as it includes the disturbances of the minor planets and of Encke's comet produced by Jupiter, and the planets exterior to it.

An example is given of the application of the formulæ to the disturbances of Encke's comet caused by Saturn. In this case the method succeeds perfectly, and there is no doubt of its applicability when the distance of the disturbed and disturbing bodies from the sun never become very nearly equal to each other. If these distances ever approach very closely to equality, or if one of them is sometimes greater and sometimes less than the other, the calculations become much more complicated. Hansen's lunar theory, "Fundamenta nova investigationis orbitæ lunæ," contains the most complete view of the principles of the method first adverted to above; but the numerical results of his formulæ have not yet been published.

His discovery of the long inequalities in the moon's motion, caused by the action of Venus, is one of the most important that has ever been made in the lunar theory; the calculations, however, have not yet appeared in a complete form.

Benjamin Collins Brodie, Esq.,

I am most happy to present you a Royal Medal for your investigations 'On the Chemical Nature of Wax.' Independent of the important addition to our knowledge of the true nature of wax, Mr. Brodie has succeeded in discovering two new alcohols of the fatty acids—Cerotin and Melissin. These bodies stand in the same relation to cerotic and melissic acids, that wood-spirit and alcohol do to formic and acetic acid.

The addition of a new alcohol to our knowledge has been pronounced by Dumas a contribution to the department of organic chemistry as important as that of a new metal is to inorganic chemistry; both serving as starting-points for future researches.

Professor Quain,

I have much pleasure in presenting you, in charge for Professor Graham, a Royal Medal for his papers 'On the Motion of Gases.' Mr. Graham's researches have disclosed the existence of a hitherto unobserved property in gaseous bodies; they relate to the flow of gases and vapours through very long capillary tubes, into a vacuous or partially vacuous space; the rapidity of motion varies in the different gases, but the rate of motion has not as yet been found connected with any other physical property. A new series of constants of high interest have been obtained by these investigations.

Colonel Sabine,

I have now the gratification of presenting to you the Rumford Medal to transmit to M. Arago, whose long and brilliant career, as one of the greatest discoverers of the age in Physical Optics, has excited the admiration of all men of science:—the discoverer of coloured polarization, of rotatory polarization, of the polarization of the sky, and of many other important facts embodied in modern works on Light. The Medal has been awarded to him for his 'Experimental investigations on Polarized Light,' the concluding memoirs on which were communicated to the Academy of Sciences of Paris during the last two years.

The President then called upon Mr. Christie to read the biographical notices of some of the deceased Members, which he handed to him.

Henri-Marie Ducrotay de Blainville was born at Arques in Normandy, September 12, 1777, of an ancient and respectable

family, and received his early education at the Military School of Beaumont-en-Auge. On the dissolution of this establishment at the Revolution, he was sent to Paris to complete his education at the "Ecole du Génie, Mathématiques et Dessin," and was exempted from the conscription of 1798 by reason of an accident in the right arm followed by partial anchylosis. He accordingly remained in Paris, occasionally attending lectures on the Natural Sciences, and studying painting in the Drawing Academy of Vincent. He had attained the age of twenty-seven, still undecided as to a profession, when, having listened to an eloquent lecture by Cuvier, at the College of France, M. de Blainville left the theatre with a determination to pursue the science of Comparative Anatomy. For this purpose, he, by the advice of M. Duméril, entered himself as a student in the School of Medicine; and after devoting three years to the usual studies, took his degree as Doctor of Medicine in 1808; the subject of his inaugural dissertation being founded on some experiments on the influence of the eighth pair of Nerves in Respiration.

The ardour of M. de Blainville in the pursuit of what had now become his absorbing science, and his skill as a draughtsman, procured for him the especial attention of Baron Cuvier, who, after employing him as a practical anatomist and artist at a salary of 2000 francs per annum, confided to him the delivery of a part of his Course of Lectures on Zoology, at the College of France; and he soon afterwards obtained, by a successful *concours*, the Chair of Zoology and Physiology at the Faculty of Sciences, on which occasion he defended his well-known Thesis 'On the Natural Affinities of the *Ornithorhynchus paradoxus*.'

At the restoration of Louis XVIII. the opportunity presented itself to M. de Blainville, through his family connexions and friends, of obtaining office in the administration of the newly-established legitimate government, to the principles of which M. de Blainville was sincerely attached. But he resisted the temptation, and remained faithful to his scientific pursuits. He took advantage of the peace to visit the Museums of England in 1816, and made many drawings of rare Mollusca in the British Museum, and of anatomical specimens in that of the Royal College of Surgeons. Several Memoirs inserted in the Bulletin of the Philomathic Society testify to the ardour with which he availed himself of his short sojourn in this country; and he soon after collected and methodized his researches into the organization of the invertebrate animals in the form of two extensive Articles in the 'Dictionaire d'Histoire Naturelle,' afterwards published as distinct works, one entitled 'Manuel de Malacologie,' the other 'Manuel d'Actinologie.' A vast number, upwards of 180, Memoirs in the 'Bulletin de la Société Philomathique,' the 'Journal de Physique,' the 'Annales' and 'Mémoires du Muséum,' attest M. de Blainville's active researches in all branches of Zoology. He published in 1822 one volume of a Course of Lectures 'On the Organization of Animals, or Principles of Comparative Anatomy,' a work which was never completed.

M. de Blainville was elected a member of the Academy of Sci-

ences in the Institute of France, as the successor of M. de Lacépède; and soon after, in 1830, was appointed to the Chair of the Natural History of the *Mollusca* and *Radiata* in the Jardin des Plantes, on the retirement of Lamarck. Two years afterwards, on the lamented demise of Baron Cuvier, M. de Blainville was nominated his successor in the Professorship of Comparative Anatomy at the Jardin des Plantes. This Professorship placed him at the head of the famous Museum of Comparative Anatomy, the formation of which had been one of the Herculean labours of Cuvier's great career; and M. de Blainville availed himself of it to commence his great work 'On the Osteography of the Vertebrate Classes,' which contains the most beautiful and accurate figures of the skeletons of a large proportion of the Mammalian Class. Twenty-three fasciculi of this work had been published, and M. de Blainville had corrected the proof-sheets of the twenty-fourth fasciculus, 'On the Osteography of the Camel-Tribe,' on the morning of his death. He had taken his place in a railway carriage for Rouen on the 1st of May, 1850; and was found, on the arrival of the train there, in a state of apoplectic insensibility. He was removed to the waiting-room; an attempt was made to bleed him, but in vain, and he soon after expired, at the age of seventy-three.

He was elected a Foreign Member of the Royal Society in 1832.

Gay-Lussac (Louis Joseph), l'un des physiciens et des chimistes les plus distingués de notre tems, naquit le 6 Décembre 1778, à St. Léonard, petite ville du département de la haute Vienne, où son père exerçait la charge de Procureur du Roi. La révolution de 1789, qui éclata lorsqu'il sortait de l'enfance, contraignit sa famille à le garder près d'elle, durant les années où il aurait pu recevoir une éducation classique, dans des tems meilleurs. Ce ne fut qu'en 1795, lorsqu'il avait déjà 16 ans accomplis, qu'un peu de sécurité étant revenue, ses parens se décidèrent à l'envoyer à Paris pour y faire quelques études, et se préparer aux examens d'admission de l'École Polytechnique. Malheureusement, une grande disette étant survenue, M. Censier, le chef de l'établissement où il était entré, se vit forcé de congédier tous ses pensionnaires. Mais les rares dispositions de Gay-Lussac, et l'aménité de son caractère, lui ayant inspiré une vive affection, il le garda, plutôt comme un fils que comme un élève. Grâce à cette heureuse association des qualités morales avec les dons de l'intelligence, qui le distingua toujours, il fut en état d'être admis à l'École Polytechnique le 27 Décembre, 1797. Il en sortit le 22 Novembre, 1800, dans les premiers rangs du service des ponts et chaussées, où les meilleurs élèves se pressaient alors. Avant de raconter ses nombreux succès, dans la carrière scientifique, nous n'avons pas cru inutile de montrer les difficultés qu'il a du traverser, pour s'en ouvrir l'accès.

Berthollet était alors professeur de chimie à l'École Polytechnique. Il remarqua ce jeune homme si bon, si zélé, si intelligent. Il en fit son répétiteur; et bientot le fixa près de lui, dans sa délicieuse retraite d'Arcueil, où, entouré de tous les instrumens du physicien et du chimiste, il travaillait à son grand ouvrage sur la statique chimique,

éclairé, soutenu, par les entretiens journaliers de son ami Laplace, dont, un peu plus tard, la résidence touchait la sienne. Ce fut sous l'influence de ces deux hommes que Gay-Lussac prit son essor.

Ils dirigèrent d'abord son jeune talent vers ce champ de recherches commun à la physique et à la chimie, que le génie inventif de Dalton avait commencé à explorer avec une activité si féconde, dans le mémoire intitulé *Experimental Essays, &c.*, qu'il publia en 1801 *. C'était en effet, à cette époque, le sujet de travail qui pouvait être le plus fructueux et le plus utile, pour fixer une foule de données dont l'emploi revient sans cesse, dans les recherches expérimentales, et qui étaient alors ignorées, ou imparfaitement établies. Obéissant à cette inspiration, Gay-Lussac fit, dans la même année, 1801, son premier mémoire sur la dilatation des gaz et des vapeurs †; puis, sans s'arrêter, une foule de recherches sur le perfectionnement des thermomètres et des baromètres, sur la tension des vapeurs, leur mélange avec les gaz, l'appréciation de leur densité, l'évaporation, l'hygrometrie, et la mesure des effets capillaires. Cela le conduisit jusqu'en 1803. Une occasion rare s'offrit alors, d'utiliser cet ensemble de connaissances physiques qu'il avait acquises. Il avait été chargé de faire, avec un de ses amis, une ascension aérostatique, pour savoir, s'il était vrai que la force magnétique cesse d'agir hors du contact de la masse terrestre, comme on l'avait annoncé. Ils constatèrent, qu'au contraire, elle se conservait sans affaiblissement notable, dans l'espace libre, jusqu'à 4000 mètres d'élévation. Mais leur ballon s'était trouvé trop faible pour les porter plus haut, tous deux ensemble. Alors Gay-Lussac fit seul une deuxième ascension, dans laquelle il s'éleva jusqu'à la hauteur de 7000 mètres, la plus grande qu'aucun homme eut jamais atteint. Il confirma l'observation déjà faite sur la persistance de la force magnétique; il rapporta de ces hautes régions, de l'air, qui, analysé, se trouva avoir la même composition qu'à la surface de la terre; et il recueillit en outre une série de déterminations importantes, sur le decroissement régulier des pressions, des températures, de l'humidité atmosphérique, dans tout l'intervalle de hauteur qu'il avait parcouru ‡. Ce dernier succès, venant, pour ainsi dire, couronner toutes ses précédentes recherches, acheva de lui donner, à très juste titre, la réputation d'un physicien consommé. Effectivement, si l'on se reporte à l'époque de ces travaux, on ne saurait y méconnaitre un progrès notable sur tout ce qui avait précédé. Les opérations, les appareils, ont un caractère de simplicité ingénieuse, qui distingua toujours Gay-Lussac. On y remarque une intention générale d'exactitude plus grande, et des résultats relativement plus précis. Toutefois, du point de vue où nous pouvons envisager aujourd'hui ces investigations, il est évident que le sujet en était trop complexe, pour être pénétré à fond par des procédés d'expérience aussi restreints. Il faut y appliquer des appareils d'une conception plus générale, et d'un mécanisme plus sur, comme plus varié, pour embrasser l'ensem-

* Mémoires de la Société Philosophique de Manchester, tome v. partie ii. page 535.

† Annales de Chimie, tome xliii. page 137.

‡ Annales de Chimie, tome lii. page 75.

ble de toutes les circonstances qui y concourent, pour suivre isolement chacune dans ses détails propres, et pouvoir en recomposer l'effet total. Enfin, il faut en éxiger une précision bien plus grande, pour apprécier, non pas seulement ce que l'on pourrait appeler le gros des phénomènes, mais aussi, et surtout, leurs particularités spécifiques, qui en établissent le caractère essentiel et intime. Ainsi, le coefficient de dilatation des gaz permanens et des vapeurs, trouvé par Gay-Lussac, était, à la vérité, plus exact que celui de Dalton ; mais il était encore loin de la réalité*. En outre, comme le physicien Anglais, Gay-Lussac la cru pareil pour tous ces fluides, tandis qu'il est sensiblement différent ; et il la supposé aussi constant pour chacun d'eux, tandis qu'il varie avec les pressions et les températures. Or, toutes minimes que ces variations nous apparaissent, dans les amplitudes restreintes où nous pouvons les observer, la connaissance seule de leur existence a une importance capitale ; puisqu'elle change toutes les idées que l'on avait pu concevoir sur la constitution des fluides aëriformes, tant qu'on en faisait abstraction.

Peut-être Gay-Lussac comprit-il ce qui lui manquait, ce qui manquait aussi à son tems, pour suivre plus loin ce genre de recherches. Car, tout en faisant un heureux et habituel usage des notions physiques qu'il y avait acquises, on ne le voit plus y revenir ; et depuis la formation de la société d'Arcueil, en 1807, il s'attacha presque exclusivement à des recherches de chimie ; ce qui forme, pour ainsi dire, la seconde phase, et la plus brillante comme la plus durable, de ses travaux.

* Soit 1 le volume qu'une masse de gaz sec occupe à la température de la glace fondante, ou 0° cent, sous la pression moyenne de l'atmosphère à la surface de la terre. Si cette masse est portée à la température de 100° Cent, *sous la même pression*, son volume deviendra :—

selon Dalton ....1·3912
selon Gay-Lussac ....1·3750

Ces déterminations sont toutes deux fautives, sous plusieurs rapports. Elles le sont, en premier lieu, dans la supposition de généralité que leurs auteurs y attachaient, puisque le coefficient de dilatation des gaz varie avec leur nature chimique, étant évalué dans des conditions pareilles. En second lieu, elles le seraient encore pour un même gaz, l'air atmosphérique par exemple, pour n'y avoir pas distingué les deux cas du problême, savoir : celui où le volume se dilate, sous une pression constante ; et celui où on le maintient constant, sons une pression variable, l'intervalle de température parcouru étant pareil. Dans ce deuxième mode d'expérimentation, le coefficient de dilatation se conclut de la force élastique par la loi de Mariotte, qui est suffisamment exacte pour ces réductions. En considérant ainsi un volume d'air atmosphérique sec, pris d'abord à la température 0°, sous la pression $0^{m}·76$, puis porté à la température de 100°, le coefficient de dilatation qui lui est propre, entre ces limites de températures, a été trouvé :—

par M. Regnault (le volume variant sous une pression constante) ....0·367
(le volume étant maintenu constant, et la pression étant variée) 0·3665
par M. Magnus (le volume étant maintenu constant, et la pression étant variée) 0·3665

D'après ces derniers résultats, qui offrent toutes les garanties d'exactitude, on voit que le nombre donné par Gay-Lussac était trop fort, et celui de Dalton plus éloigné encore de la vérité dans le même sens. On doit à Rudberg, d'avoir fait connaitre aux expérimentateurs le défaut du coefficient de Gay-Lussac, jusqu'alors adopté universellement, sans qu'on l'eut vérifié. Il le réduisit à 0·3645, valeur plus rapprochée de la vérité, mais un peu trop faible ; tant les dernières décimales des déterminations physiques sont difficiles à obtenir avec une entière sureté.

Il ne serait pas possible de mentionner ici tous ses mémoires. Ils se suivent, presque sans interruption, dans les volumes des *Annales de Chimie et de Physique*, pendant plus de trente années. Partout, jusque dans les plus simples notes, on apperçoit ses qualités distinctives, un esprit droit, lucide, des conceptions nettes, et la fermeté de jugement qui le retient toujours dans l'expression stricte des faits. On les reconnaîtrait à ces caractères, sans qu'elles fussent signées. Pour montrer le rang élevé où il s'est placé, comme chimiste, nous rappellerons seulement ceux de ses travaux qui, par leur nouveauté, leur importance, ou les progrès ultérieurs dont ils ont été l'origine, nous semblent mériter le plus d'être signalés.

Celui que nous mentionnerons d'abord, lui fut suggéré par une observation qui remonte presque aux débuts de sa carrière chimique. En 1804, M. Alexandre de Humboldt, déjà célèbre par son voyage aux régions équinoxiales, avait fait au jeune Gay-Lussac l'honneur de se l'associer pour des recherches d'eudiométrie. Ils reconnurent que, dans la formation de l'eau, 100 parties en volume de gaz oxygène, se combinent, par la combustion, avec un volume de gaz hydrogène si proche d'être égal à 200 parties, que l'on ne pouvait pas répondre expérimentalement de la différence*. La tendance de ces nombres vers une limite simple, frappa Gay-Lussac. Il soupçonna immédiatement que le rapport exact de 1 à 2 était le véritable, et que cette simplicité pouvait bien être un fait général, analogue, pour les volumes, à celui que Dalton avait découvert, pour les proportions de poids suivant lesquelles les corps forment leurs combinaisons de différens ordres. Ayant suivi silencieusement cette idée, avec persévérance, dans tous les cas d'application qu'il put trouver, il la présenta comme certaine quatre ans plus tard, à la fin de 1808, non sans quelque crainte de la part de ses amis†. Le résultat, tel qu'on peut l'énoncer aujourd'hui, consiste en ce que : *Lorsque deux gaz se combinent, leurs volumes ont entre eux des rapports numériques simples ; et le volume du composé qu'ils forment, étant considéré à l'état de gaz, présente aussi un rapport simple, avec la somme des volumes des gaz qui sont entrés dans la combinaison.* Cette *loi des volumes* est devenue une des plus utiles que l'on ait trouvées en chimie, bien qu'il ait fallu quelque tems pour qu'on en sentit la valeur. L'énoncé que nous venons d'en donner, ne diffère de celui de Gay-Lussac, que par une étendue et une précision d'application, dues aux progrès du tems. La simplicité des rapports qu'elle suppose n'existe, et ne peut évidemment exister, qu'autant que l'on néglige les inégalités de dilatation des gaz, qui, étant presque toujours insensibles dans les expériences de chimie habituelles, restreignent, plutôt théoriquement que pratiquement, son usage. Il ne faut pas mettre à la charge de Gay-Lussac les systêmes que l'on a voulu y rattacher, en ne tenant pas compte de cette circonstance ; car il ne les a jamais acceptés. Les spéculations hypothétiques répugnaient souverainement à la nature de son esprit.

Il dut se décider à faire connaître cette loi des volumes, sans plus de retard, quand il apperçut les utiles applications qu'elle avait déjà,

* Annales de Chimie, tome liii. page 248.

† Mémoires de la Société d'Arcueil, tome ii. page 207.

dans une série de recherches chimiques, dont il s'était activement occupé avec M. Thénard, pendant tout le cours de cette même année 1808. La fin de la précédente, 1807, venait d'être illustrée par une grande découverte ; continuation heureuse des études patientes faites par Hisinger et Berzelius, sur le pouvoir du courant voltaique pour désunir les élémens des corps composés. En soumettant les effets de ce pouvoir à des expériences nombreuses et précises, les deux chimistes Suédois avaient constaté la faculté générale qu'il a, non seulement de séparer les principes des combinaisons, mais aussi de les transporter à des pôles contraires, par exemple l'oxygène des oxides, et des acides, au pôle vitré ; le principe complémentaire, au pôle résineux. Durant l'année 1806, Davy s'était profondément occupé de ces phénomènes de transport. Concevant toute leur importance, il les avait multipliés, variés, et il avait fait mille efforts pour fixer les conditions de leur accomplissement. Il les reprit encore l'année suivante, avec des appareils voltaiques plus puissants, et il parvint à décomposer ainsi la potasse et la soude. Il en avait extrait des substances d'apparence métallique, malléables, éminemment conductrices de l'électricité. D'une vue hardie et sure, il les signala d'après ces caractères, comme deux métaux simples, qu'il nomma le *potassium* et le *sodium*. Les deux alcalis en étaient des oxides. Pendant que le grand chimiste Anglais poursuivait avec ardeur les innombrables effets de ces nouvelles substances, comme agens de décomposition des autres corps, Gay-Lussac et M. Thénard se jettèrent ensemble dans cette voie, à sa suite. Ils découvrirent, et annoncèrent bientôt (7 Mars, 1808) un procédé chimique, qui fournissait les nouvelles substances beaucoup plus abondamment que les appareils voltaiques.* Ils pûrent ainsi étudier leurs caractères propres, et leurs actions sur les autres corps, avec plus de facilité, de généralité, de précision. Dans la multitude de ses premières tentatives, Davy avait apperçu des indices évidens, mais presque insaisissables, de la décomposition de l'acide borique, qu'il avait seulement signalés, sans pouvoir les suivre, pressé par tant d'autres objets. Mettant à profit les agens actifs qu'ils s'étaient procurés, les deux expérimentateurs Français attaquèrent cet acide, en le chauffant avec le potassium. Ils lui enlevèrent ainsi son oxygène, isolèrent son radical, qu'ils appelèrent *le bore*, et le reproduisèrent aussi, par synthèse.† Davy obtint bientôt après des résultats pareils,

* Ils firent arriver la potasse et la soude fondues, au contact du fer incandescent, maintenu à une très haute température. Voyez Recherches Physico-chimiques, faites par MM. Gay-Lussac et Thénard, tome i. page 74 et suiv.

† La première annonce de ce procédé, et de ses résultats, fut communiquée à l'Institut par une note, lue, au nom de Gay-Lussac et de Thénard, le 20 Juin 1808. Elle fut imprimée immédiatement, dans le bulletin de la Société Philomatique, pour le mois de Juillet de cette même année, page 173. Gay-Lussac était alors gravement malade d'une explosion qui avait failli l'aveugler. Davy annonça des tentatives du même genre, mais moins avancées, dans un mémoire daté du 30 Juin, qui est inséré aux transactions philosophiques de 1808, voyez page 343, note. Les résultats définitifs des deux chimistes Français ont été consignés au Moniteur, dans les Nos. des 14 et 15 Novembre 1808. Ceux de Davy le furent dans sa leçon Bakérienne, datée du 15 Décembre, qui est insérée aux transactions philosophiques de 1809 ; voyez page 75. Voyez aussi pages 41 et 42, le passage où il reconnaît avec une entière sincérité qu'il s'est servi du procédé (happy method) de Gay-Lussac et Thénard, pour la préparation du potassium, préférablement à l'action voltaique.

s'étant pourvu désormais de potassium par la méthode chimique, dont il reconnut noblement les avantages. Pendant cette année 1808 et les suivantes, les travaux incessans du savant Anglais furent, pour Gay-Lussac et Thénard, le sujet fécond d'une vive et continuelle concurrence. Il ne fallait pas moins qu'une rivalité aussi active, pour mettre si vîte au jour tous les trésors que renfermait sa découverte. La lutte s'établissait, au profit de la science, dans les idées, comme dans les faits. Ainsi, une dissidence d'un moment s'éleva, sur la nature des substances que Davy avait signalées. Les effets qu'on en obtenait pouvaient se représenter à peu près aussi bien, en admettant qu'elles fussent, comme il le croyait, des métaux simples, qui formaient la potasse et la soude par leur combinaison avec l'oxygène ; ou en supposant qu'elles fussent des hydrures de ces bases alcalines, totalement dépouillées d'eau. Cette dernière interprétation semblait se rattacher mieux que l'autre aux idées antérieurement admises en France. Sous cette influence, Gay-Lussac et Thénard l'embrassèrent d'abord ; mais une exploration plus étendue des faits la leur fit ensuite abandonner, pour revenir au sentiment de Davy, qui est aujourd'hui adopté universellement dans toute l'extension qu'il lui avait donnée dès l'origine ; les expériences ultérieures l'ayant pleinement confirmé*.

Une alternative d'interprétation analogue s'offrit encore à leur esprit, quand eux, et Davy également, se servîrent du potassium, pour essayer de décomposer les deux corps que l'on appelait, à cette époque, l'acide muriatique, et l'acide muriatique oxygéné. Mais, quoique la question fut particulière, elle avait une importance capitale pour la théorie de Lavoisier, jusqu'alors universellement admise. Dans cette théorie, l'acide muriatique devait être le premier dégré d'oxidation d'un radical inconnu ; et l'acide muriatique oxygéné en était le deuxième. En combinant ce second corps, à l'état de gaz sec, avec l'hydrogène gazeux, on reformait le premier, qui, alors, devait contenir de l'eau. Or, aucun procédé, aucun agent chimique, ne réussissait à y faire constater la présence des deux élémens de cette eau, qu'on y supposait ; et l'on n'en pouvait jamais dégager qu'un seul, l'hydrogène. D'une autre part, on ne parvenait pas à extraire, du gaz muriatique oxygéné sec, la moindre trace d'oxygène. Après une active concurrence de recherches expérimentales, variées des deux côtés, avec une égale persévérance, Gay-Lussac et Thénard apperçûrent que l'on pouvait éluder la difficulté, en intervertissant les relations théoriques des deux corps ; c'est à dire, en considérant celui qu'on appelait oxygéné comme une substance simple, qui, par sa combinaison avec l'hydrogène, formait l'autre acide†. Cette nouvelle vue faisait brêche à la théorie de Lavoisier, où l'on suppose que l'oxygène est le seul principe acidifiant. Ils se bornèrent, trop prudemment peut-être, à la présenter comme également compatible avec les faits ; et, retenus par la considération des grands changemens qu'elle nécessitait, dans l'ensemble de leurs rapports, jusqu'alors admis, ils continuèrent d'em-

* Voyez la discussion de ce point de théorie, Recherches Physico-Chimiques, tome ii. page 218 et suiv.

† Mémoires de la Société d'Arcueil, tome ii. page 358. Lu à l'Institut le 27 Février 1809.

ployer l'ancienne interprétation comme préférable. Davy n'était pas astreint aux mêmes réserves. Après beaucoup de tentatives, faites dans l'ancienne voie, il se prononça exclusivement pour l'idée que l'acide muriatique oxygéné était une substance simple, et il lui donna le nom de *chlorine*, en français *chlore*, qu'on lui a conservé*. Ce choix était conforme aux règles de la philosophie expérimentale, n'exigeant qu'une seule hypothèse, celle de la simplicité du chlore, tandis que l'autre interprétation en exigeait trois, savoir : la présence de l'oxygène dans un des corps; de l'eau dans l'autre ; et, en outre, l'existence du radical inconnu. Mais l'initiative du doute, et l'énoncé de l'alternative, appartiennent, par leur date, aux deux chimistes Français, comme Davy l'a reconnu lui-même†. Or, si l'on considère la grande autorité des opinions qui régnaient autour d'eux, on trouvera qu'il a fallu beaucoup de force et d'indépendance de jugement, pour s'en affranchir, même jusque là. C'est ce que des témoins, encore vivans, pourraient attester.

Les vues que cette controverse avait fait naître, devinrent très utiles à Gay-Lussac, lorsque vers la fin de 1813, son attention se porta sur une nouvelle substance, qu'un manufacturier Français, M. Courtois, avait découverte dans les lessives de Varecks. Le 6 Décembre, il lut à l'Institut un court mémoire, dans lequel il établissait ses propriétés distinctives, et la désignait, comme substance simple, par le nom d'*Iode*, en Anglais *Iodine*, qui lui est resté. Ayant reconnu, dès ces premières épreuves, son analogie avec le chlore, il l'avait engagée aussitôt, dans une multitude de combinaisons parallèles, où elle porta des caractères semblables. Il l'avait combinée de même avec l'hydrogène, et en avait obtenu ainsi un acide puissant, qu'il appela *Hydriodique*, s'autorisant de ce nouveau fait, pour se rallier ouvertement au mode d'interprétation qu'il avait voulu d'abord adopter, dans le cas du chlore. Quinze jours après, le 20 Décembre, il annonça qu'il était parvenu à combiner aussi l'iode avec l'oxygène, d'ou résultait un deuxième acide, qu'il appelait l'*iodique*. Ceci pouvait paraître un apperçu contestable ; il le confirma plus tard, par une autre voie. Dans l'intervalle de ces deux communications, Davy se trouvait à Paris, son génie lui ayant servi de titre à un passeport exceptionnel. On vit alors un bel exemple d'émulation scientifique. On lui avait donné quelque peu de la nouvelle substance. Il en fit des essais en petit, avec cette adresse ingénieuse, qui lui faisait trouver, dans les moindres objets, des instrumens d'expérimentation. A' la prière de ses amis, au nombre desquels étaient ses émules, il consigna le résumé de ses observations, dans une note, qui fut lue à l'Institut le 13 Décembre, après la première, et avant la seconde communication de Gay-Lussac. Tous deux, depuis, conti-

* Researches on the oxymuriatic acid, &c., Philos. Trans. for 1810, p. 231. Lu à la Société Royale le 12 Juillet 1810. Bakerian Lecture. Phil. Trans. for 1811, lu à la Société Royale le 15 Novembre, 1810.

† Researches on the oxymuriatic acid, &c. Philosoph. Trans. for 1810, page 237. Voyez aussi, dans ce même mémoire, page 232, la citation faite par Davy, des recherches de Gay-Lussac et Thénard, publiées dans le 2e vol. de la Société d'Arcueil, où l'initiative de la nouvelle hypothèse est consignée.

nuèrent à s'occuper de ce sujet, pendant l'année suivante, avec une égale activité d'esprit, mais dans des conditions de travail bien différentes. Davy, devenu riche par un mariage récent, se rendait avec sa femme en Italie. Quelques instrumens de précision, et de manipulation, quelques réactifs chimiques bien purs, les plus indispensables, lui composaient un laboratoire portatif, qui le suivait partout, et lui suffisait. Il n'avait à sa disposition qu'une petite quantité d'iode, et ne pouvait donner aux expériences que les momens de loisir d'un voyage d'agrément: mais sa pensée y était toujours. Des trois mémoires qu'il adressa à la Société Royale, au sujet de l'iode, le premier est daté de Paris, le second de Florence, le troisième de Rome*. Ce dernier est du mois de Février, 1815. Il contient la découverte de l'acide iodique, à l'état solide et cristallisé, tandis que Gay-Lussac ne l'avait obtenu qu'en dissolution dans l'eau, ou en combinaison avec des bases, de manière à en donner toutefois l'analyse exacte. Du reste, par une conséquence naturelle, ces mémoires de Davy offrent une riche collection de faits détachés, habilement vus, plutôt qu'un travail d'ensemble. Gay-Lussac, mieux pourvu de matière, d'instrumens, et de tems, effectua ce travail dans les sept premiers mois de 1814†. Guidé par l'analogie qu'il avait reconnue entre le chlore et l'iode, il développa savamment et patiemment ce parallèle ; la suivit dans toutes ses combinaisons, acides, salines, métalloides, éthérées, dont il assigna la composition ; et il fixa toutes ses propriétés spéciales, si exactement, que l'on a pu seulement, depuis, étendre les résultats qu'il avait obtenus, ou perfectionner les procédés qu'il avait employés, sans rien trouver à reprendre à ses déterminations. E'tant parvenu à extraire l'acide iodique, des iodates, le même sentiment de correspondance le conduisit à extraire pareillement l'acide chlorique, des chlorates, d'où on ne l'avait pas encore retiré ; et il en donna l'analyse exacte en proportions de poids, ainsi que de volumes. Son mémoire, inséré au tome 91 des Annales de Chimie, présente un remarquable ensemble de toutes les connaissances physiques et chimiques, appliquées à l'étude d'un nouveau corps, avec une sureté de jugement, et une finesse de tact, qui ne laissent rien d'incertain ou d'inexploré. Il est aussi complet et parfait qu'un travail chimique peut l'être, à son temps donné. C'est là que Gay-Lussac présenta le premier exemple de l'emploi qu'on peut faire de *la loi des volumes*, pour conclure, par induction, la densité des vapeurs des corps, que l'on ne sait pas vaporiser matériellement. Il se servit de cette méthode pour calculer la densité de la vapeur de l'iode qui n'était pas encore connue, et l'expérience a confirmé depuis cette détermination, si hardie alors.

Un an plus tard, en 1815, Gay-Lussac mit le sceau à sa réputation de chimiste, par la découverte de l'azoture de carbone, ou *cyanogène*. Indépendamment d'une multitude de faits nouveaux qu'elle a donnés,

* Transactions Philosophiques pour 1814, page 74, daté de Paris, 10 Décembre 1813, lu à la Soc. Re. 20 Janvier, 1814 ; même volume, page 487, daté de Florence 23 Mars, 1814, lu à la Soc. Re. 16 Juin 1814. Trans. Philos. pour 1815, page 203, daté de Rome, 10 Février, 1815, lu à la Soc. Re. 20 Avril 1815.

† Son mémoire fut lu à l'Institut le 1er Aout 1814.

et de la lumière qu'elle a jettée sur beaucoup de points jusqu'alors obscurs, cette découverte a été d'une haute importance pour la science chimique, sous deux rapports. D'abord, parcequ'elle a offert le premier exemple d'un corps composé, qui porte, et garde, dans ses combinaisons, les caractères de simultanéïté que l'on avait cru jusqu'alors appartenir aux substances réputées simples; en outre, parceque, venant après celle de l'iode, et de l'hypothèse faite sur la simplicité du chlore, elle acheva de montrer avec évidence que l'oxygène n'entre pas comme élément nécessaire, dans la composition des corps qui possèdent les propriétés d'un acide ou d'un sel. Gay-Lussac étudia ce nouveau produit, dans toutes ses phases de combinaison et d'isolement*: il détermina toutes ses propriétés physiques et chimiques, immédiates. Il définit rigoureusement sa composition par deux procédés d'analyse précis, et divers; d'abord en le faisant détonner dans l'eudiomètre de Volta; puis en le brûlant par le bioxide cuivre; ce qui était un perfectionnement considérable de la méthode qu'il avait antérieurement imaginée avec M. Thénard, pour analyser les matières organiques par voie de combustion. Il développa alors toutes les particularités de constitution, tant du cyanogène même, que de ses combinaisons, dans leurs rapports avec la loi des volumes qu'il avait découverte. On retrouve, dans ce beau travail, toutes les excellentes qualités d'esprit qu'il avait montrées dans l'étude de l'iode. Mais la sagacité et la sureté avec lesquelles il sut saisir les caractères si imprévus du nouveau produit qu'il avait formé, complétèrent l'idée que l'on avait conçue de son mérite, en y ajoutant la gloire d'un inventeur pénétrant et prudent.

Ici il donna le second exemple pratique, de la loi des volumes employée pour calculer la densité des vapeurs des corps non vaporisables. Les nombreuses vérifications qu'il en avait faites sur les composés divers des corps gazeux, lui ayant inspiré toute confiance dans ses applications, il eut la hardiesse d'en conclure la densité *que devait avoir* la vapeur du carbone, laquelle se trouvait être un élément commun à toute la série des produits qu'il avait à étudier. Il l'inféra de la composition de l'acide carbonique, en supposant que 1 volume de ce gaz renferme 1 volume d'oxygène, plus 1 volume de vapeur de carbone, sans condensation; et le nombre ainsi obtenu lui servit ensuite avec succès, pour exprimer tous ses autres produits par des rapports simples de volumes, d'où résultait leur composition pondérale. Evidemment, la certitude de ce genre d'induction n'est pas absolue, puisqu'elle se fonde sur le rapport de contraction ou d'expansion que l'on attribue aux vapeurs composantes, dans les vapeurs composées, en leur appliquant de plus la loi de Mariotte, qui ne s'y adapte pas avec une entière rigueur. Mais, sauf ce dernier inconvénient, qui est inévitable, le rapport supposé devient d'autant plus probable, qu'on l'établit, dans chaque cas, sur des analogies de combinaisons plus intimes. D'ailleurs, d'après le principe général de la loi, si le nombre représentatif de la densité auquel on est conduit n'est pas le véritable, il en sera toujours, approximativement, un multiple simple; ce qui permettra de l'introduire dans la série des combinaisons, sans dénaturer leurs relations

* Annales de Chimie, tome xcv. page 136, et suiv.

essentielles. Cette extension donnée par Gay-Lussac à la théorie des proportions définies, a été une des innovations les plus hardies et les plus fécondes que l'on ait apportées, de nos jours, dans la science chimique.

Poursuivant toujours la même vue, il montra peu après, dans une courte note, comment des corps composés, physiquement très divers, étant considérés à l'état de gaz, peuvent être idéalement constitués par des groupes de vapeurs, représentant d'autres corps, toujours les mêmes, mais assemblés en nombres divers et simples, de volumes gazeux.* Cette conception est reconnue aujourd'hui comme la seule rationnelle et générale, par laquelle on puisse exprimer, et mettre en évidence, les rapports de composition des substances organiques entr'elles. Il ne faut pas imputer à ce principe l'abus qu'on en a pu faire, en prenant, contre l'intention de son auteur, ces possibilités de représentation, pour des réalités absolues, comme cela est arrivé trop souvent.

L'espace nous manque, pour analyser, même pour mentionner, une foule d'autres travaux importans de Gay-Lussac. Nous avons pu citer seulement, parmi leur grand nombre, ceux qui nous ont paru le mieux le caractériser. Pendant les années qu'il y consacra, son talent reconnu l'éleva, sans effort, à tous les honneurs des sciences. Professeur de physique, ou de chimie, dans plusieurs établissemens publics, il porta dans son enseignement, comme partout ailleurs, la dignité simple, et un peu froide de ses manières, avec la netteté, la droiture, la justesse d'appréciation, qui étaient habituelles à son esprit. Mais ensuite, une autre carrière, sinon plus belle, ou plus attrayante, du moins plus profitable à ses intérêts, de fortune, s'ouvrit pour lui, et l'absorba bientôt presque entièrement. Depuis 1805, il était membre du comité consultatif des arts et manufactures, établi près le ministère du commerce. En 1818, on l'attacha aussi à l'administration des poudres et salpêtres. Il s'était marié en 1808, à une personne dont l'affection répondait à la sienne, et il était devenu père de famille. Dans ces circonstances, il parut regarder désormais comme un devoir de tourner son talent vers les applications. Ce fut ainsi qu'il publia successivement des instructions pratiques d'une grande utilité, sur la fabrication de l'acide sulfurique hydraté, sur les essais des chlorures décolorans, des alcools, des alcalis employés aux usages du commerce, &c. On y retrouve son même caractère, d'adresse ingénieuse, d'exactitude, d'habileté prudente, adapté avec une rare intelligence à la simplicité des manipulations industrielles. En cherchant à se rendre l'industrie profitable, il voulait aussi l'avancer; et son intégrité n'aurait consenti, pour aucun prix, comme le font tant d'autres, à propager, ou à étayer par l'autorité de son nom, des procédés, ou des entreprises, dont le succès ne lui aurait pas paru assuré scientifiquement. C'était toujours le même homme, dans une autre sphère. En 1829 il fut nommé essayeur du bureau de garantie de la monnaie, emploi très lucratif; et, au lieu des procédés de la coupellation employés exclusivement jusqu'alors, il imagina, et introduisit dans les opérations qu'on lui confiait, l'essai de l'argent par la voie humide, ce qui leur donna un dégré nouveau et remarquable, de facilité, de rapidité, de

* Annales de Chimie, tome xcv, page 311.

précision. Il prit aussi de sérieux intérêts dans une fabrique de glaces, qui fûrent suivis de grands avantages réciproques. Depuis qu'il fut entré dans cette voie des affaires, il dut, pour sa consistance même, désirer d'avoir une place dans les grandes assemblées politiques. Il fut nommé membre de la chambre des députés en 1831 ; puis, en 1839, membre de la chambre des pairs. Mais, heureusement pour lui, il échappa aux inconvéniens de ces positions périlleuses, parceque, n'y remplissant que le rôle passif d'un savant considéré, il s'arrangeait politiquement à peu près de tout, et ne faisait obstacle à personne. Cette dernière phase de sa vie fut donc honorablement industrielle et sociale, plutôt que scientifique. Il est mort le 9 Mai 1850, d'une atrophie du cœur, dans sa 72e année, après s'être longtems bercé de l'espérance de revenir un jour aux nobles travaux qui avaient fait sa célébrité.

The Rev. William Kirby, M.A., Rector of Barham, Suffolk, was born at Witnesham Hall in that county, the residence of his father, who was by profession a solicitor, Sept. 18, 1759. His mother was Lucy, daughter of Mr. Daniel Meadows of the same parish. His grandfather, John Kirby (born 1690), as we learn from a notice by a near relative in the 'Literary Gazette', wrote 'The Suffolk Traveller,' a work of considerable reputation in its day; and his uncle, Joshua Kirby, was the author of 'Dr. Brook Taylor's Perspective made easy.' This Joshua Kirby was the intimate friend of Gainsborough, who directed by his will that he might be buried by his side—a desire which was carried into effect,—and was appointed to the office of Comptroller of the works at Kew, by His Majesty George III., with whom he was a great favourite. Mrs. Trimmer was his daughter, and consequently first cousin to Mr. Kirby.

Mr. Kirby was educated at the Grammar School at Ipswich, whence he removed in his seventeenth year to Caius College, Cambridge. Here he pursued his studies with diligence, and laid so good a foundation, that he subsequently earned the reputation of being a sound and accurate scholar. In the year 1781 he took the degree of B.A.; in the year 1782 he was admitted into holy orders, having been nominated by the Rev. Nicholas Bacon to the joint curacies of Barham and Coddenham. By his exemplary conduct in the discharge of his parochial duties, he so gained the esteem of Mr. Bacon, that he left him by his will the next presentation to the rectory of Barham; to this he was inducted in the year 1796, so that for sixty-eight years he exercised his ministry in the same charge, residing also in the same parsonage-house.

Mr. Kirby's first love for natural history was awakened by his mother occasionally lending him, when a boy, some of the more showy foreign shells from her cabinet to play with, as a reward for good conduct. He was accustomed to ask for his favourite Shells by their names, which he learned from his mother, and to this early pleasurable association of the nomenclature of objects of natural history, with the objects themselves, it is probable that he

derived no small portion of the pleasure which he felt in his maturer years, from the dry and tedious investigations (as some would have deemed them) in which he delighted to engage, to ascertain the names and the relative priority of those given by former naturalists, to any plant or insect before him.

Mr. Kirby's taste for natural history lay dormant during his university studies, as so often happens in similar cases, but was re-excited as soon as he entered on his curacy, proving how important it is that an early bias in this direction should be given in youth, and how vast a fund of enjoyment is lost to our clergy from the unfortunate neglect of this science in our schools. The land-shells about Barham, which it is probable from his boyish predilections he would first collect, being soon exhausted, he naturally turned his attention to botany, and in the course of time became thoroughly acquainted with the flowering-plants around him, which he investigated by the aid of Smith's 'English Botany' and other botanical works. When these were becoming scarce, that he began to observe the Cryptogamic tribes, may be inferred from his having one day in the spring of 1809 conducted Sir W. Hooker and Mr. Spence to the habitat of a rare species of Marchantia? on a particular bank, several miles from Barham,—the excursion ending in a ludicrous adventure, which in after years he often related when speaking of his natural history rambles.

How far his Cryptogamic investigations would have been pursued, it is impossible to say; but it is not unlikely that but for an incident which turned his thoughts into another channel, that of Entomology, he might have been led to carry them out with the characteristic ardour with which he followed up every pursuit in which he engaged, and that Mosses, Lichens and Confervæ would have absorbed that attention which he afterwards gave exclusively to insects.

The incident referred to, which he has himself very graphically related in the 'Introduction to Entomology' (vol. ii. p. 227), was his accidentally observing and being led to admire and preserve a yellow Cow-lady (*Coccinella 22-punctata*), which was crawling on his window-sill. So little up to this time had he attended to insects, that this species, which is not uncommon, struck him with surprise and admiration, and led him forthwith to search for others; and every new acquisition increasing his wonder and delight with the vast and beauteous region of Nature thus opened to his view, he threw aside botany and devoted himself wholly to entomology—thus affording another proof, how great events spring from small causes.

While collecting and studying the insects round Barham for some years, during which he communicated several valuable papers to the Linnean Society, of which he had become a Fellow, he particularly directed his attention to the tribe of wild-bees, and finding how few of them were described and how little they had been systematically studied, he made notes on the various species and families, till at length his materials were so considerable as to become

the foundation of his great work, the 'Monographia Apum Angliæ,' which appeared in 1802, in two volumes 8vo. This work would have been thought remarkable as the unaided production of a country clergyman and entomologist of no long standing, had it been a mere description of a greatly extended number of the previously recognised British species of the Linnean genus *Apis*; but when we consider that he had not only brought together and described upwards of two hundred species of the tribe, but with an admirable largeness and correctness of view had divided them into numerous families and subfamilies, so natural, that most of them have since been adopted as genera, and that he took lessons in the art of etching for the express purpose of being enabled to give a correct idea of the parts of the mouth on which his divisions were mainly founded, we shall not be surprised that it excited the warmest admiration of British and foreign entomologists on its appearance, and at once elevated him to the rank of one of the first entomologists of the age.

During the next five or six years, Mr. Kirby collected materials for, and contributed to the Linnean Society, two very valuable papers on the genus *Apion*, in which he described a great number of new species.

In the year 1808, Mr. Spence, who had carried on an active entomological correspondence with Mr. Kirby for the preceding two or three years, proposed to him, with the view of remedying the want of a good English introduction to the science, that they should jointly write one—a proposal to which Mr. Kirby at once assented, as he did to Mr. Spence's subsequent extension of it, that the work should not be merely technical as was his first idea, but be thrown into a popular form, comprising under various heads all the known facts relative to the habits and economy of insects, and their noxious or useful properties, &c., and in the shape of letters so as to admit of a more discursive mode of treating the subject. The general plan having been thus agreed on, Mr. Spence spent several weeks with Mr. Kirby at Barham, in the spring of 1809, to fill up its details, and to commence the letters on external anatomy and orismology, which were the portions first written, and on this occasion and on similar visits in subsequent years, every term and its definition were discussed by the authors, and the other letters written by each, jointly criticised.

It would not be easy to overrate the influence which this work (of which vol. i. was published in 1815, vol. ii. in 1817, and vols. iii. and iv. in 1826) had on Mr. Kirby's subsequent entomological career. Not only did it supply, under its various heads, suitable places for introducing from his note-book, his numerous detached observations during many years, on the manners, economy, &c. of insects, which but for this opportunity would probably have been lost to the world, but the necessity of extending his former studies as to the anatomy and nomenclature of the parts of bees, to those of all the other orders, and of investigating many new points of their history, led to a great accession to his previous knowledge, which

bore ample fruit both in the work in question and in his future ones.

Of these, following his admirable paper on his new order "*Strepsiptera*" and his "Century of Insects" in the 'Linnean Transactions,' the most important was his 'Bridgewater Treatise,' "On the History, Habits and Instincts of Animals," published in the 76th year of his age, in which he brought together a vast number of curious and important facts in the natural history of animals, and urged their application in proof of the wisdom and goodness of the Creator with that persuasive and pious ardour with which he always endeavoured to lead his readers, like himself, "to see God in all things."

This is not the place to enumerate the titles of his numerous less important papers in the 'Zoological Journal,' and other periodical works on natural history, and it must suffice to notice his last great work, the entomological portion of the 'Fauna Boreali-Americana' of Sir John Richardson, published in a quarto volume in 1837, in which he described the insects of the northernmost region of America with a largeness of grasp as to their generic and family relations, and a clearness and accuracy as to their specific characters, fully proving that at the very advanced age of nearly eighty, his entomological zeal and acumen had not diminished.

Some time before the publication of this work, Mr. Kirby, feeling that his entomological career was appropriately closed by it, gave his whole collection of British and Foreign Insects to the Entomological Society of London, of which he had been elected the Honorary President on its establishment in 1833—a noble gift, for which future entomologists, who will thus have access to the very species he described in his various works, will feel a deep debt of gratitude.

Constant and unwearied as were Mr. Kirby's entomological labours, they never encroached on his professional and social duties. His parishioners of every class looked up to him as a father, on whose advice, sympathy and assistance they might confidently rely, and the whole tenor of his long life proved him to be at once one of the kindest of friends and most simple-minded, warm-hearted and pious of men.

Mr. Kirby was elected a Fellow of the Royal Society in 1818, and became one of the Linnean Society soon after its institution in 1788. Besides being Honorary President of the Entomological Society and President of the Ipswich Museum, he was a Fellow of the Geological and Zoological Societies, and an Honorary Member of several foreign societies. He died July 4, 1850, aged ninety years and ten months, and was buried in the chancel of his church at Barham.

Sir Robert Peel was born on the 5th of February, 1788, at Bury, in Lancashire. His father was one of our greatest manufacturers, a very wealthy and a very able man, remarkable for the vigour of his mind and the extent of his practical knowledge.

Sir Robert was educated at home with great care till of a proper

age for a public school, and then was sent to Harrow, where, applying himself with unusual diligence, he made rapid progress in his studies, and in his seventeenth year entered Christchurch, Oxford.

The new examination statutes had been recently passed, subjecting all persons who proposed to take a degree to a public examination, with a graduated scale of honours proportioned to their proficiency, either in a mixed course of Classics and Aristotelian Philosophy, or a course of Mathematics and Physics, the first class being the highest honour. Sir Robert Peel at once undertook to read for the highest honours in both courses, and was the first person who succeeded. In 1808 he graduated, and after that he does not appear to have pursued his scientific studies further, but entering the House of Commons as representative of the Borough of Cashel, he devoted himself exclusively to politics. He was soon appointed Under Secretary for the Home Department, and filling in succession the various offices, the highest prizes of a successful political career, he eventually became Prime Minister.

With science politicians in this country have not usually much to do: Sir Robert Peel, however, was a Member of the Committee in which the scientific pensions originated, and on several occasions as a Minister of the Crown he awarded scientific pensions. Fully alive to the importance of science as the basis of the engineering and manufacturing pre-eminence of this country, he was in the constant habit of consulting scientific men whenever he had any new commercial measures to bring forward, or whenever a difficulty arose which called for scientific assistance; but he does not seem to have devoted any portion of his leisure moments to scientific reading, or to have kept up the mathematical knowledge he had early acquired at Oxford; and he appears to have regarded science with interest rather for the sake of its applications to practical purposes than as a high and ennobling pursuit.

Looking to Sir R. Peel's great abilities, his commanding influence, his unrivalled powers as a man of business, his success at Oxford, which was evidence that he had then the power of using the keys of exact knowledge, it is natural that scientific men should have been anxious for his assistance in the management of the Associations for the Advancement of Science. He was a Trustee of the British Museum, and was most efficient; but when it was intimated to him that there was a general wish that he should permit himself to be put forward more prominently either as a President of the British Association, or in some other way, he declined, stating that he was not qualified, as science was not one of his pursuits. On the 29th of June, having been in the House of Commons till four o'clock in the morning, he attended an early meeting of the Royal Commissioners for the Exhibition of 1851, assisting in the transaction of business with his usual vigour and judgement, and soon after the meeting he was thrown from his horse and received the fatal injuries of which he died on the 2nd of July.

On the motion of the Marquis of Northampton, seconded by Sir Harry Inglis, Bart., the best thanks of the Society were tendered to the President for his excellent Address, and his Lordship was requested to permit the same to be printed and circulated to the Society.

The Statutes relating to the election of Officers and Council having been read, and Mr. Spence and Mr. Yates having, with the consent of the Society, been nominated Scrutators, the votes of the Fellows present were collected.

The following Noblemen and Gentlemen were reported duly elected Officers and Council for the ensuing year:—

President.—The Earl of Rosse, K.P., M.A.

Treasurer.—Lieut.-Col. Edward Sabine, R.A.

Secretaries. { Samuel Hunter Christie, Esq., M.A.
Thomas Bell, Esq.

Foreign Secretary.—Captain W. H. Smyth, R.N.

Other Members of the Council.—John Joseph Bennett, Esq.; William Bowman, Esq.; Sir Benjamin Collins Brodie, Bart.; The Rev. Professor Challis, M.A.; Lieut.-General Sir H. Douglas, Bart., G.C.B.; Sir P. de Malpas Grey Egerton, Bart.; John Forbes, M.D.; Marshall Hall, M.D.; Gideon A. Mantell, Esq., LL.D.; Professor W. Hallows Miller, M.A.; Sir R. Impey Murchison, M.A.; Richard Phillips, Esq.; Rt. Hon. Sir Frederick Pollock, M.A.; George Rennie, Esq.; Edward Solly, Esq.; Lord Wrottesley.

The thanks of the Society were given to the Scrutators for their trouble in examining the lists.

The President appointed the following gentlemen Vice-Presidents of the Society:—Col. Sabine, R.A., Sir Benjamin Collins Brodie, Bart., Sir P. de Malpas Grey Egerton, Bart., Sir R. I. Murchison, Right Hon. Sir Frederick Pollock, and George Rennie, Esq.

The following is a statement of the Receipts and Expenditure during the past year:—

Statement of the Receipts and Payments of the Royal Society between Nov. 30, 1849, *and Dec.* 1, 1850.

RECEIPTS.

				£	s.	d.
Balance in the hands of the Treasurer at the last Audit ..				553	4	9
Weekly Contributions, at one shilling				44	4	0
Quarterly Contributions at £4				1102	0	0
17 Admission Fees				170	0	0
2 Compositions for Annual Payments at £60				120	0	0
4 Compositions for Annual Payments at £40				160	0	0
One year's rent of estate at Mablethorpe: due at Michaelmas 1849	125	0	0			
One year's Income Tax	3	13	0			
				121	7	0
One year's rent of estate at Acton: due at Michaelmas 1850	70	0	0			
One year's Income Tax	2	0	10			
				67	19	2
One year's Fee farm rent of lands in Sussex: due at Michaelmas 1850				19	4	0
One year's rent from Royal College of Physicians				3	0	0
Dividends on Stock:—						
One year's dividend on £14,000 Reduced 3 per cent. Annuities	420	0	0			
Less Income Tax	12	5	0			
				407	15	0
One year's dividend on £6385 3*s.* 8*d.* 3 per cent. Consols	191	6	6			
Less Income Tax	5	7	2			
				185	19	4
Half a year's dividend on £600 3 per cent. Consols	9	0	0			
Less Income Tax	0	5	3			
				8	14	9
One year and a half's dividend on £3452 1*s.* 1*d.* 3 per cent. Consols, produce of sale of premises in Coleman Street	155	6	9			
Less Income Tax	4	10	6			
				150	16	3
Carried forward..........				3114	4	3

				£	s.	d.
Brought forward..........				3114	4	3
Donation Fund.						
One year's dividend on £5331 10*s.* 8*d.* Consols	159	18	6			
Less Income Tax	4	13	0			
				155	5	6
Rumford Fund.						
One year's dividend on £2430 12*s.* 5*d.* Consols	72	17	9			
Less Income Tax	2	1	9			
				70	16	0
Fairchild Fund.						
One year's dividend on £100 New South Sea Annuities				3	0	0
Bakerian Lecture and Copley Medal Fund.						
One year's dividend on £366 16*s.* 1*d.* New South Sea Annuities	10	18	0			
Less Income Tax	0	6	2			
				10	11	10
Wintringham Fund.						
One year's dividend on £1200 Consols	36	0	0			
Less Income Tax	1	1	0			
				34	19	0
Miscellaneous Receipts:—						
Sale of Philosophical Transactions, Abstracts of Papers, and Catalogues of the Royal Society's Library				298	9	3
Mablethorpe Tithe Suit Release....................				42	18	5
Total Receipts......				£3730	4	3

PAYMENTS.

				£	s.	d.
Fairchild Lecture.—The Rev. J. J. Ellis, for delivering the Fairchild Lecture for 1850				3	0	0
Bakerian Lecture.—Thomas Graham, Esq., for the Bakerian Lecture for 1850				4	0	0
Books purchased:	£	s.	d.			
Dulau and Co.: for Books	43	3	2			
Taylor: for ditto	29	16	2			
Nutt: for ditto......................	5	15	9			
Gould: for ditto	12	12	0			
Curtis: for ditto	21	0	0			
Second-hand ditto	16	2	6			
				128	9	7
Carried forward..........				135	9	7

				£	s.	d.
Brought forward				135	9	7
Salaries :—						
S. H. Christie, Esq., one year, as Secretary	105	0	0			
Thomas Bell, Esq., one year, as Secretary	105	0	0			
Ditto for Index to Phil. Trans.	5	5	0			
Col. Sabine, one year, as Foreign Secretary	20	0	0			
Charles R. Weld, Esq., one year, as Assistant-Secretary	300	0	0			
Mr. White, one year, as Attendant	100	0	0			
G. Holtzer, one year, as Porter	30	0	0			
Ditto, for extra Porterage	10	0	0			
				675	5	0
Purchase of £600 0*s*. 0*d*. 3 per cent. Consols				573	0	0
Fire Insurance, on the Society's Property				45	1	6
Gratuity to Bank Clerks				1	1	0
Bills :—						
Taylors :						
Printing the Phil. Trans., 1849, part 2	217	13	3			
Ditto, 1850, part 1	168	13	3			
Ditto, Proceedings, Nos. 73—75; Circulars, Lists of Fellows, Ballot-lists, Statement of Payments, and Minutes of Council; Government Grant Committee, Notices, &c. &c.	135	18	0			
				522	4	6
Basire :						
Printing Plates in Transactions, 1849, part 2	95	12	4			
Engraving, 1850, part 1	98	18	0			
Ditto, part 2	86	4	0			
				280	14	4
Dinkel :						
For Lithography	8	8	0			
Wing :						
For ditto	16	0	0			
Scharf :						
For ditto	15	0	0			
F. Gyde :						
For Woodcutting	17	1	6			
Walker :						
For Printing Charts	104	12	0			
				161	1	6
Bowles and Gardiner :						
Paper for the Phil. Trans., 1849, part 2, and 1850, part 1				188	2	0
Carried forward				2581	19	5

				£	s.	d.
Brought forward				2581	19	5
Gyde:						
Boarding and Sewing 800 Parts of Phil. Trans., 1849, part 2	11	4	0			
Ditto, 1850, part 1	11	4	0			
Ditto, Extra binding	25	19	11			
				48	7	11
Tuckett:						
Bookbinding	40	5	0			
Limbird:						
For Stationery	19	17	11			
Saunderson:						
For Shipping Expenses	11	19	1			
Norman:						
For ditto	3	16	3			
Brecknell and Turner:						
Candles, and Lamp Oil	35	4	6			
Arnold:						
For Coals	30	7	0			
Meredith:						
Mats, Brushes, Fire-wood, &c.	8	7	6			
Cubitt:						
For repairs and relaying Carpets, &c.	22	13	0			
Slack:						
For Repairs	2	7	11			
Shoolbred:						
For Carpets, Curtains and Matting	61	12	11			
Woodward:						
For Cases and Shelves	3	19	6			
Sharpus:						
For China	3	7	4			
Humphries:						
For Livery	5	10	0			
Tea, Waiters, &c. at Ordinary Meetings	33	9	6			
Higgins:						
Valuing Estate at Mablethorpe	5	5	0			
Ditto, draining ditto	100	0	0			
Seguier:						
For restoring two Portraits	8	8	0			
Coombe:						
For Picture Frames	4	0	0			
				400	10	5
Taxes:						
Land and Assessed Taxes	21	5	0			
Income Tax	4	19	2			
				26	4	2
Carried forward				3057	1	11

				£	s.	d.
Brought forward..........				3057	1	11
Rumford Fund:						
Mr. Wyon, for Medals	64	0	0			
M. Arago, Dividend	77	12	0			
				141	12	0
Donation Fund:						
Dr. Hofmann, for Chemical Investigations	100	0	0			
Mr. Miller, for Meteorological Observations	50	0	0			
Mr. Newport, for Physiological Investigations	50	0	0			
Dr. Frankland, for Chemical Investigations	50	0	0			
				250	0	0
Petty Charges:						
Postage and Carriage..................	43	4	2			
Expenses on Foreign Packets, &c.........	12	6	11			
Stamps	2	5	0			
Charwoman's Wages..................	27	16	6			
Extra Cleaning	4	12	0			
Miscellaneous expenses	34	7	1			
				124	11	8
Balance in the hands of the Treasurer				156	18	8
Total....£				3730	4	3

GEORGE RENNIE, *Treasurer.*

November 30th, 1850.

Estates and Property of the Royal Society.

Estate at Mablethorpe, Lincolnshire (55 A. 2 R. 2 P.). Rent £110 per annum.

Estate at Acton, Middlesex (33 acres). Rent £70 per annum.

Fee farm rent in Sussex, £19 4*s.* per annum.

One-fifth of the clear rent of an estate at Lambeth Hill, from the College of Physicians, £3 per annum.

£14,000 Reduced 3 per cent. Annuities.

£19,399 7*s.* 10*d.* Consolidated Bank Annuities.

£366 16*s.* 1*d.* New South Sea Annuities.

The Receipts during the past year, exclusive of the Balance, amounted to:—£3176 19*s.* 6*d.*

The Expenditure during the same period, exclusive of the sum of £600 0*s.* 0*d.* invested in the Funds, was:—£3000 5 7

The Balance in hand, now belonging to the Donation Fund, is £115 11*s.* 2*d.*

Annual Contributions.

1830	£363	4	0
1831	286	0	0
1832	255	6	0
1833	283	7	6
1834	318	18	6
1835	346	12	6
1836	495	0	0
1837	531	0	0
1838	599	4	0
1839	666	16	0
1840	767	4	0
1841	815	12	0
1842	910	8	0
1843	933	16	0
1844	1025	16	0
1845	1010	0	0
1846	1074	0	0
1847	1116	8	0
1848	1122	16	0
1849	1130	16	0
1850	1146	4	0

In the notice of admissions, those of the Right Hon. Lord John Russell, M.P. and the Most Reverend The Lord Archbishop of Canterbury, at the ordinary Meeting of the Society, on the 25th January 1849, were omitted.